

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Education
Advanced Subsidiary/Advanced



CYD-BWYLLGOR ADDYSG CYMRU
Tystysgrif Addysg Gyffredinol
Uwch Gyfrannol/Uwch

312/01

BIOLOGY

MODULE BI2

A.M. MONDAY, 5 June 2006

(1 hour 30 minutes)

For Examiner's Use Only

Total Marks	
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INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

1. (a) Name the following:

- (i) The general term for plants adapted to survive in conditions of low water availability. [1]

.....

- (ii) Fibres found in the heart that spread excitation to the ventricles from the atrioventricular node. [1]

.....

- (iii) The community that is the end result of succession. [1]

.....

(b) Distinguish between the following terms:

- (i) Asthma and Emphysema. [1]

.....

.....

.....

- (ii) Tracheids and Sieve Tubes. [1]

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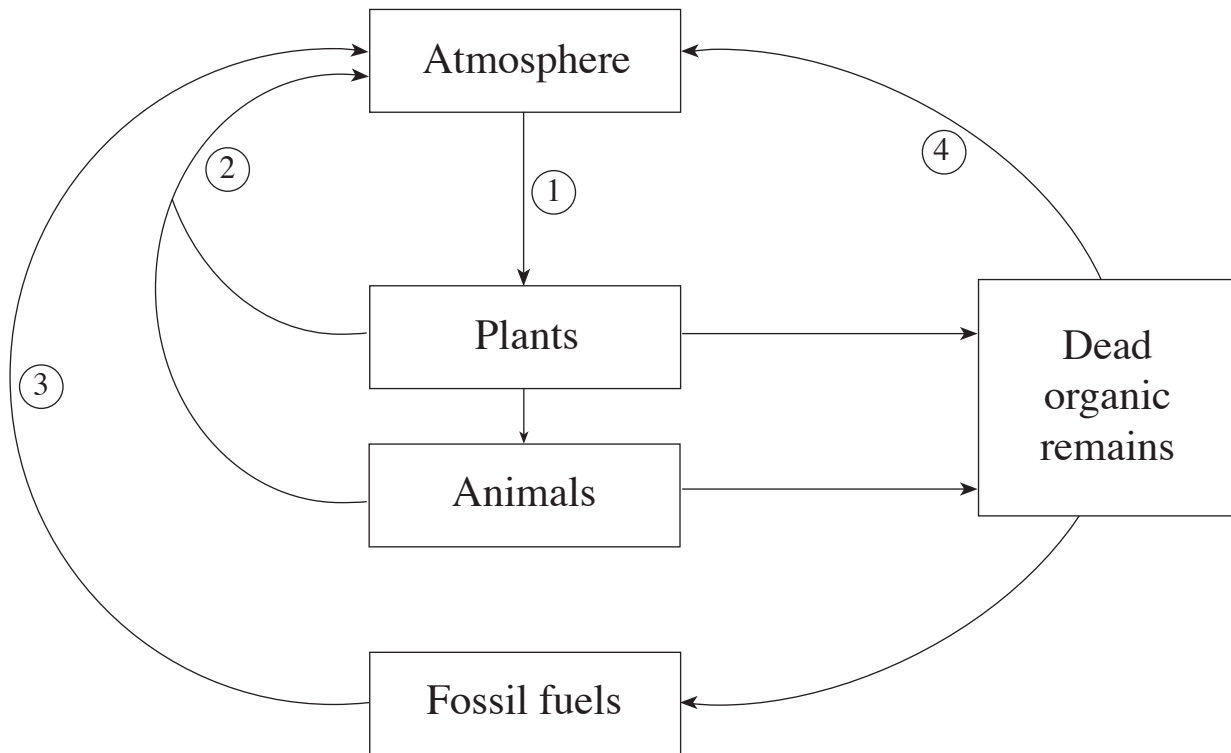
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(Total 5 marks)

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2. (a) The diagram below shows the carbon cycle.



- (i) Name the processes labelled 1-4.

[2]

1.
2.
3.
4.

- (ii) In what form are carbon atoms most commonly found in the atmosphere?

[1]

.....

(b) The table below shows the changes in land use over the last decade.

		<i>Year</i>		
		<i>2000</i>	<i>2000</i>	<i>1990-2000</i>
Region	Total land area ('000 ha)	Area of forest ('000 ha)	Forest as % of land	Change in forest area ('000 ha)
Africa	2 978 394	649 866	21.8	–5 262
Asia	3 084 746	547 793	17.8	–364
Europe	2 259 957	1 039 251	46.0	881
North and Central America	2 136 966	549 304	25.7	–570
Oceania	849 096	197 623	23.3	–365
South America	1 754 741	885 618	50.5	–3 711
World	13 063 900	3 869 455	29.6	–9 391

(i) Define the term deforestation. [1]

.....

.....

(ii) In which region did the greatest deforestation take place between 1990 and 2000? [1]

.....

(iii) From the table, what appears to have happened in Europe between 1990 and 2000? [1]

.....

(iv) Suggest how the overall trend in land use might affect the global carbon cycle. [2]

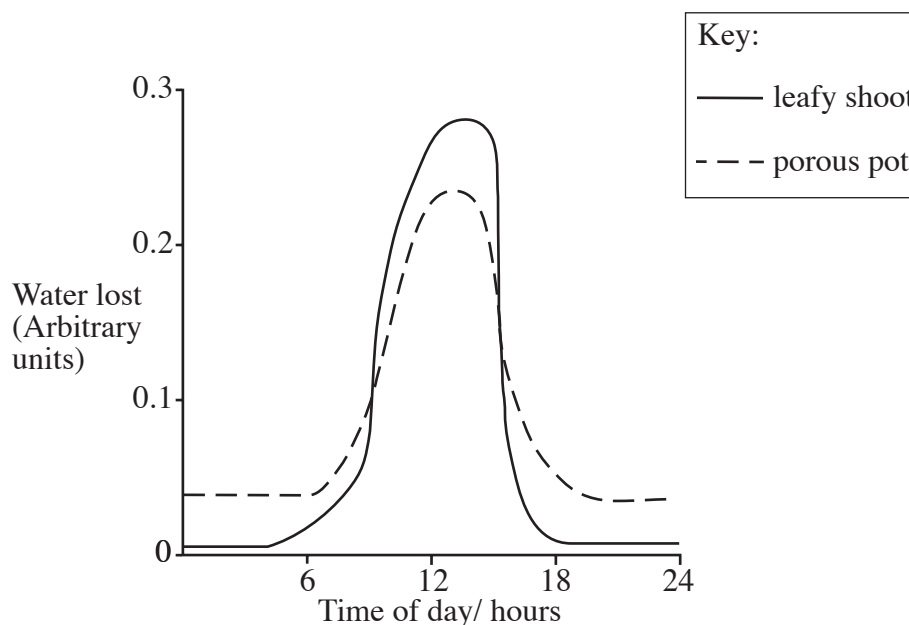
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(Total 8 marks)

3. (a) A porous pot filled with water will lose water through its walls. A pot such as this may be connected to a potometer in the same way as a leafy shoot. The graphs below compare water lost by transpiration from a leafy shoot with that lost by evaporation from a porous pot (atmometer) during a summer's day and night.



- (i) Describe the difference between the water loss in the leafy shoot and the porous pot during the hours of darkness. [1]

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- (ii) The leafy shoot and the porous pot were kept in the same location. Using information from the graphs name a factor that affects transpiration but not evaporation. [1]

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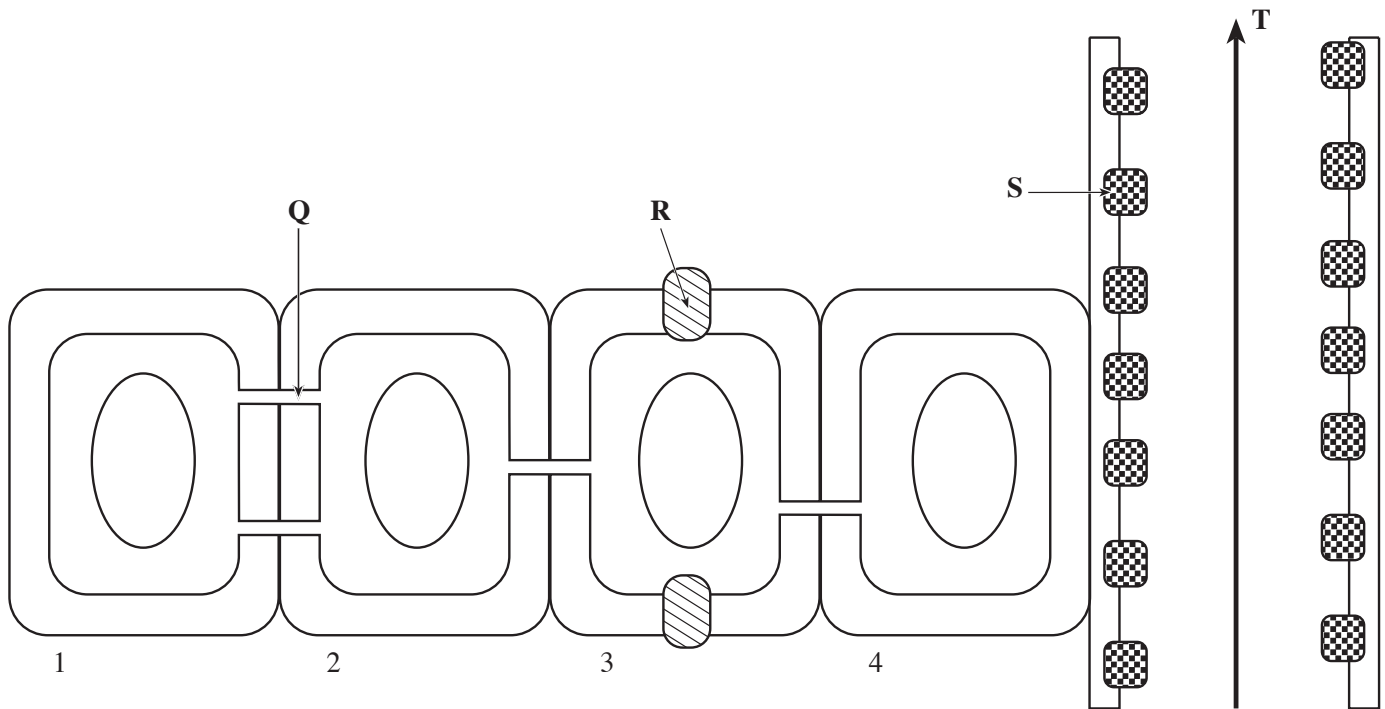
- (iii) Explain why the factor you named in part (ii) affects transpiration in the leafy shoot but not evaporation from the porous pot. [2]

.....

.....

.....

(b) The diagram shows adjacent cells from the root of a plant in longitudinal section.



(i) Name structures **Q** and **R**.

[2]

Q **R**

(ii) Explain how the loss of water molecules from leaves causes water to flow as indicated by arrow **T**.

[2]

.....

.....

.....

(iii) Using a series of arrows, draw and clearly label the **apoplast** pathway between cells 1 and 3 on the diagram above.

[1]

(iv) Using a series of arrows, draw and clearly label the **symplast** pathway between cells 1 and 3 on the diagram above.

[1]

(v) Structures **R** and **S** are made of two different substances that share a physical property. What property do these substances share?

[1]

.....

(vi) Why is this property important for the function of **R**?

[1]

.....

.....

(Total 12 marks)

4. (a) Multicellular organisms like fish and mammals have part of their body surface modified to form specialised respiratory surfaces.

- (i) Describe **four** properties that the respiratory surfaces of fish and mammals have in common. [2]

.....

.....

.....

.....

- (ii) Give **two** advantages to a mammal of having internal lungs. [2]

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- (b) Both fish and mammals have ventilation mechanisms.

- (i) Explain the function of ventilation mechanisms. [2]

.....

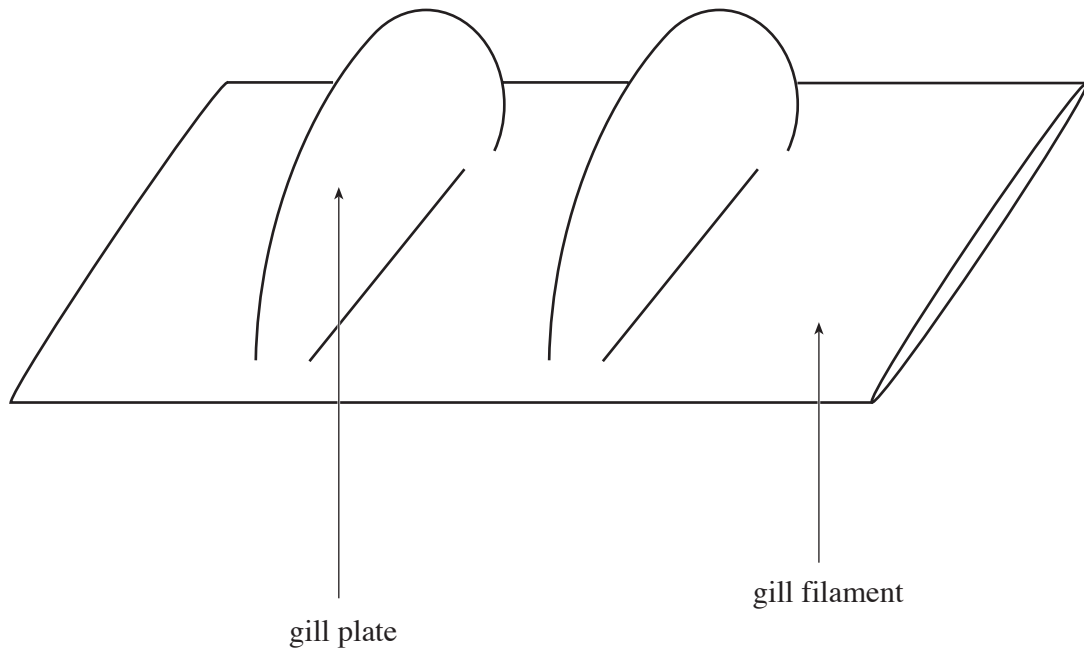
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- (ii) Name the muscles which operate the ventilation mechanism in mammals. [2]

.....

.....

- (iii) Use labelled arrows to complete the following diagram to show the relationship between flow of water and flow of blood in the gills of a fish. [2]



- (iv) What term is used to describe this relationship? [1]

.....

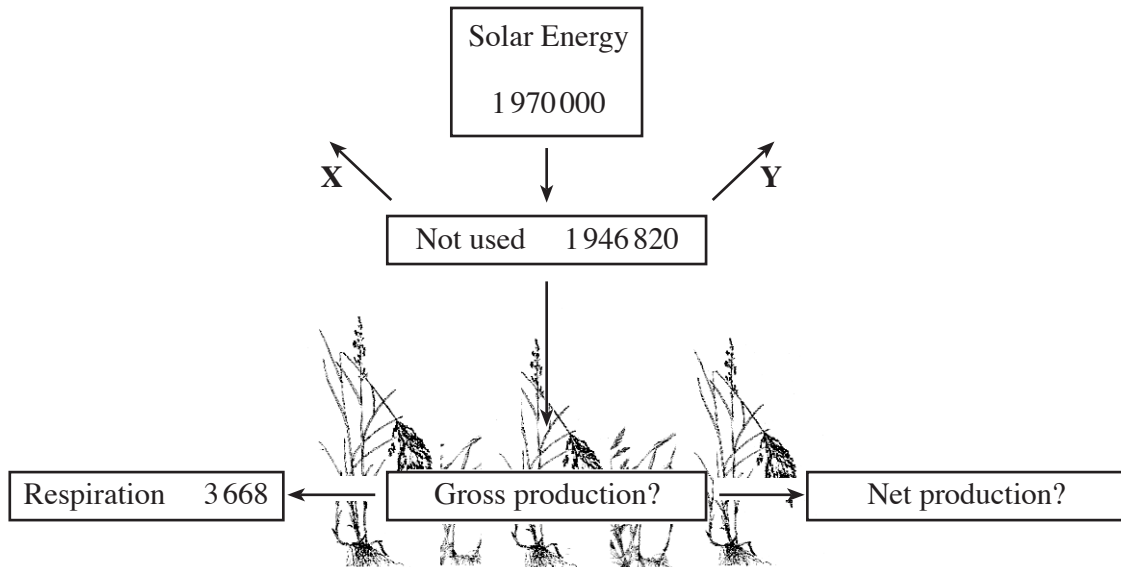
- (v) Why does this increase the efficiency of the system? [1]

.....

.....

(Total 12 marks)

5. (a) The diagram below shows the fate of solar energy that falls upon the vegetation of a field community. All measurements are in $\text{kJ m}^{-2}\text{yr}^{-1}$.



- (i) The arrows **X** and **Y** represent the fate of solar energy that falls upon the field but is not used in photosynthesis. Give **two** things that might happen to this light energy. [2]

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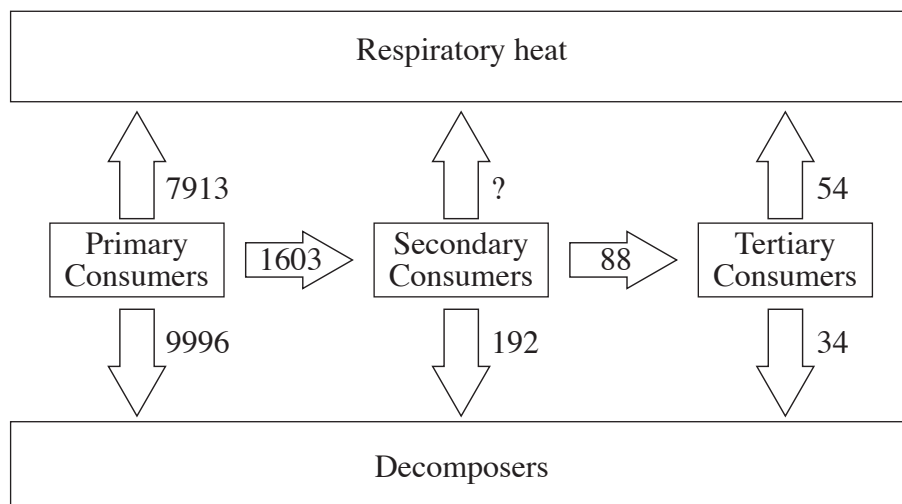
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- (ii) Use the figures in the diagram to calculate the gross production and the net production of the field. [2]

Gross production $\text{kJ m}^{-2}\text{yr}^{-1}$

Net production $\text{kJ m}^{-2}\text{yr}^{-1}$

- (b) Energy flow between the animals in the field is shown below.



- (i) Calculate the energy lost as heat by the secondary consumers.
(Measurements again in $\text{kJ m}^{-2}\text{yr}^{-1}$.)

[1]

- (ii) What products of the primary consumers will be available to decomposers as sources of energy?

[1]

- (c) The principles of energy transfer through food chains can be employed to compare the efficiency of different farming methods.
The table compares food use and rate of growth in cattle and rabbits.

	<i>Cattle</i>	<i>Rabbits</i>
Number of animals	1	300
Total body weight	600 kg	600 kg
Food consumed/day	7.5 kg	30 kg
Time taken to eat 1 tonne of hay	120 days	30 days
Weight gain/day	0.9 kg	3.6 kg
Total weight gain/tonne of hay	108 kg	108 kg
Heat loss/day	84 000 kJ	336 000 kJ

- (i) Which is the more efficient converter of hay into meat?

[1]

- (ii) Give a reason for your choice.

[1]

- (iii) Why do the rabbits lose more heat than the cow?

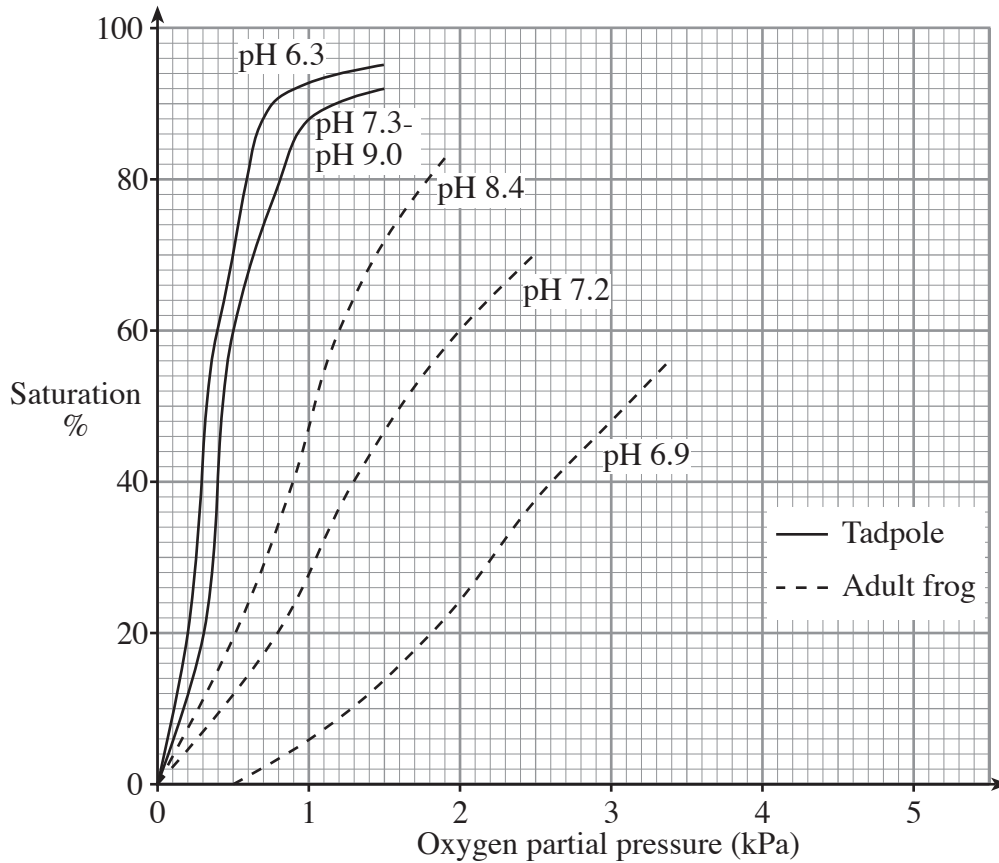
[1]

- (iv) Give **one** way in which a rabbit farmer might be able to reduce the heat loss and explain how this practice would affect meat production in the rabbits.

[2]

(Total 11 marks)

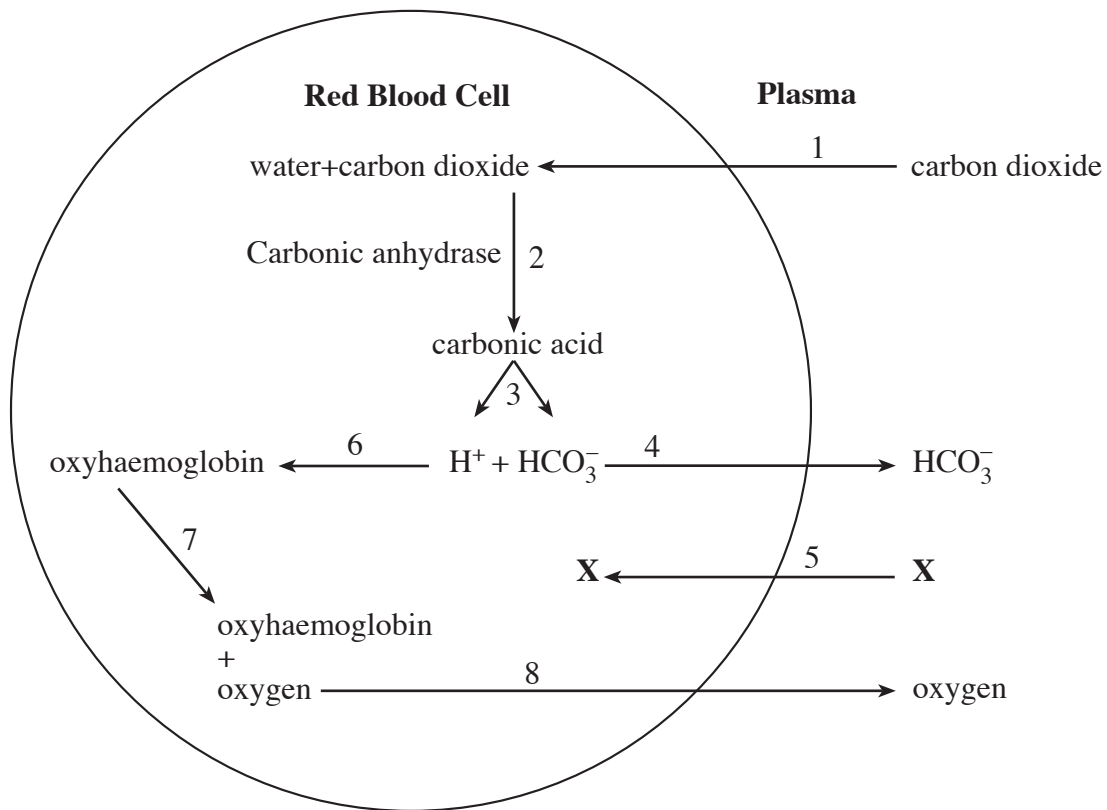
6. Oxygen uptake by haemoglobin in blood is dependent upon the partial pressure of the available oxygen, the graphs show the relationship between haemoglobin saturation and partial pressure of oxygen in tadpole and in adult frog blood.



- (a) State the percentage haemoglobin saturation at an oxygen partial pressure of 1 kPa in
- tadpole blood at pH 6.3,
 - adult frog blood at pH 6.9. [2]
- (b) Estimate the oxygen partial pressure for 50% haemoglobin saturation at pH 8.4 in
- tadpole blood,
 - adult frog blood. [2]
- (c) Describe the effect of increasingly acidic conditions upon the level of haemoglobin saturation in
- tadpole blood, [1]
.....
 - adult frog blood. [1]
.....

- (d) Tadpoles normally live in stagnant pools with low oxygen levels and high carbon dioxide content. Explain how tadpole blood is well adapted for life in low oxygen concentration. [1]

- (e) The diagram shows the role played by red blood cells in the transport of carbon dioxide. The red blood cell shown is located in respiring tissue.



- (i) Carbon dioxide dissolves only very slowly in water. Inside red blood cells however it dissolves quickly. Use information from the diagram to explain why carbon dioxide dissolves more quickly inside red blood cells. [1]

- (ii) Name the ions **X** which enter the red blood cells. [1]

- (iii) Explain why ions **X** move into the red blood cells. [1]

- (iv) Use steps 6, 7 and 8 to explain why a high carbon dioxide concentration in tissues causes more oxygen to be released by red blood cells. [2]

(Total 12 marks)

Turn over.

7. Answer **one** of the following questions.

Any diagrams included in your answer must be fully annotated.

Either, (a) Define the term population. Give an account of factors that affect population growth and population size, distinguishing between density dependent and density independent factors. [10]

Or (b) Describe the changes in pressure which occur as blood flows from the heart through the various types of blood vessels and returns to the heart. Explain the cause of each of the changes you describe. [10]

[illegible]

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(312-01)